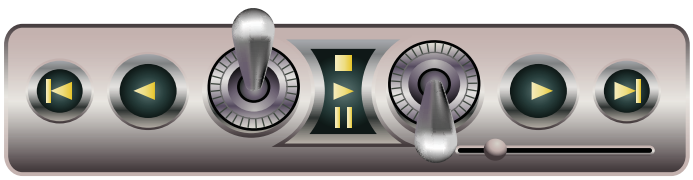
Flight Surgeon Refresher Course

Section 3: Aeromedical Training

Fatigue

(FSRC302)



FATIGUE

Introduction

Army aircrew members are subjected to operational tempos that force them to be awake and alert for long periods of time.

Since the research literature and experience tell us that stress and fatigue can affect decision making in the cockpit, it is imperative that aircrew are aware of and minimize the effects of fatigue.

It is impossible to entirely eliminate fatigue from the lives of aircrew members, but flight surgeons can help reduce the effects of fatigue on aircrew.

Objectives:

a. **Identify the adverse effects of fatigue in the aviation environment and countermeasures to reduce their impact on individual health, aviation safety and mission completion.**

b. **Define fatigue**

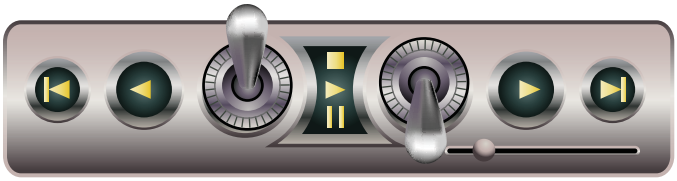
c. **Describe the three types of fatigue**

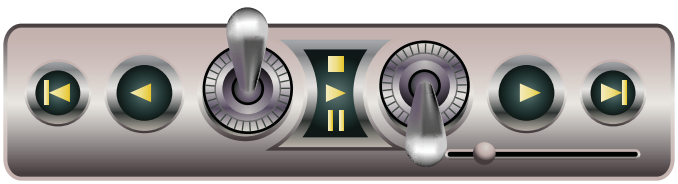
d. **Identify indicators of fatigue and describe the effects of fatigue on performance.**

e. **Describe the normal diurnal rhythms and circadian desynchronization (jet lag).**

f. **List the characteristics of the sleep cycle and sleep requirements for the average aircrew member.**

g. **Discuss strategies for the prevention and treatment of fatigue.**





What is fatigue?

- Fatigue is the state of feeling tired, weary, or sleepy that results from prolonged mental or physical work, extended periods of anxiety, exposure to harsh environments, or loss of sleep.
- Boring or monotonous tasks may increase fatigue.
- As with many other physiological problems, crewmembers may not be aware of fatigue until they make serious errors.
- Sleep deprivation, disrupted diurnal cycles, or life event stress may all play a role in producing fatigue and concurrent performance decrements.

Types of Fatigue

It is useful to independently describe the effects of acute and chronic fatigue.

Acute fatigue:

Acute fatigue is associated with physical activity or mental activity between two regular sleep periods.

The loss of both coordination and awareness of errors is the first type of fatigue to develop. This tiredness is felt, for example, at night after being awake for 12 to 15 hours in a day.

With adequate rest or sleep, typically after one regular sleep period, the aircrew member will overcome this fatigue.

Acute fatigue is characterized by:

- inattention
- distractibility
- errors in timing
- neglect of secondary tasks
- loss of accuracy and control
- lack of awareness of poor performance
- irritability

Chronic fatigue:

Chronic fatigue is much more serious than acute fatigue, occurs over a longer period of time, and is typically the result of inadequate recovery from successive periods of acute fatigue.

Besides physical tiredness, a mental tiredness also develops.

It may take several weeks of rest to completely eliminate chronic fatigue; and there may be underlying social causes, such as family or financial difficulties, that must be addressed before any amount of rest will significantly impact this person's recovery.

It is critical that the crewmember or unit commander identifies chronic fatigue early and has the flight surgeon treat the crewmember appropriately.

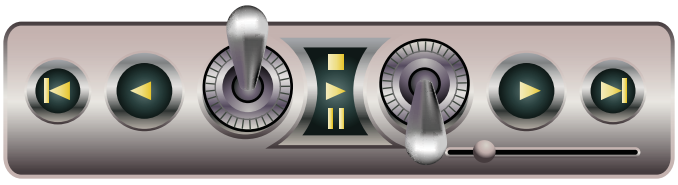
Chronic fatigue is characterized by some or all of the following characteristics:

- insomnia
- depressed mood
- irritability
- loss of appetite
- weight loss
- poor judgment
- slowed reaction time
- poor motivation and performance on the job

Motivational exhaustion:

If chronic fatigue proceeds untreated for too long, the individual will eventually "shut down" and cease functioning occupationally and socially.

This is called "motivational exhaustion" or "burnout."



Indicators of Fatigue

- Attention/Concentration difficult
- Appear dull and sluggish
- Attempt to conserve energy by reducing body movements to minimum
- Appear careless, uncoordinated, confused, irritable
- Cognitive deficits are typically seen before physical effects are felt.

Fatigue Symptoms

In general, fatigued individuals look less attentive, move slowly, both physically and mentally, and may appear careless, lackadaisical, uncoordinated, and at times confused.

They may also show an alteration in mood, either depressed or irritable and withdrawn. The fatigued individual will often appear impaired to others before he or she is actually aware of being physically fatigued.

Consequently, it is important that crewmembers watch each other for signs of fatigue when on operations where the threat of fatigue is high.

Fatigue and Performance

Fatigue has a number of negative effects in the cockpit.

Fatigue changes reaction time

- Increases in reaction time occur because of the general decrease in motivation and sluggishness that often accompany fatigue.
- Decreases may also occur, however, when individuals become impulsive and react too quickly and poorly.

Fatigue reduces attention

- Fatigued crewmembers may exhibit a tendency to overlook or misplace sequential task elements, like leaving out items on a pre-flight checklist.
- Aviators may also become preoccupied with single tasks or elements, like paying too much attention to objects outside the aircraft while in NVG flight, to the exclusion of checking instruments and flying the aircraft.
- In general, fatigued crewmembers have little awareness of their impaired performance and may feel physically OK.
- It is therefore important that crewmembers monitor each other closely in operations where fatigue is likely.

Fatigue impairs memory

- Although long-term memory is reasonably well preserved during fatigue, short-term memory and processing capacity are greatly affected.
- Aviators may have difficulty recalling operational events, like the location of the Objective Rally Point, and may neglect peripheral tasks, like forgetting to check if the landing gear is down.
- Communication is also impaired by fatigue, as crewmembers may become more withdrawn or irritable, less clear in their speech, and more prone to misunderstanding messages.

Extreme fatigue

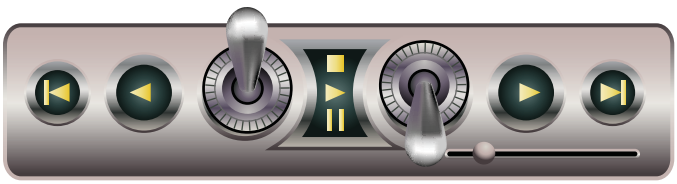
- Can actually lead to hallucinations and problems thinking, causing the individual to appear as if they have a thought disorder or psychosis.

Diurnal Rhythms

One of the factors that influences fatigue is the body's diurnal rhythm. All human beings have an intrinsic biological clock, or diurnal rhythm, with a cycle of roughly 24-25 hours.

Many important bodily functions such as core body temperature, alertness, heart rate and sleep cycle vary along this rhythm.

Given the typical diurnal cycle, performance, alertness, and body temperature peak between 0800 and 1200,



drop off slightly between 1300 and 1500, then begin to increase again from 1500 to 2100, and then drop off again and fall to a minimum trough between 0300 and 0600 hours. Most individuals experience a performance "nadir" during this early afternoon and early morning period.

While the body clock is inherently capable of monitoring the passage of time, it differs from most clocks in that it is flexible and must be set, or synchronized, before it can accurately predict the timing of events.

External synchronizers or "Zeitgebers" (a German word that literally means "time givers") are sunlight, meals, one's work schedule, and ambient temperature.

Of these cues, sunlight is the most influential in setting the biological clock.

Most individuals experience a performance "nadir" during this early afternoon and early morning period.

Avoid high-risk or attention based tasks during these periods.

Circadian Desynchronization

- Rapid travel from one time zone to another causes the body to resynchronize its diurnal rhythms to the local geophysical and social time cues.
- Until intrinsic rhythms are reset, sleep disorders and fatigue will prevail.
- This condition is known as "jet lag."
- Traveling eastward shortens the day, whereas westward travel lengthens the day.
- Consequently, resynchronization occurs much more rapidly when traveling west.
- Importantly, it is the timing of sleep, not necessarily the amount of sleep, which is most significant in determining whether one will be rested or fatigued.
- A sleep schedule that is inconsistent with one's diurnal rhythm and the light and social cues of the environment will ultimately result in fatigue.
- Frequent changes in one's sleep schedule may also cause fatigue.
- Consequently, shift work can have effects similar to crossing time zones due to the changes in light exposure and activity times.

Sleep Cycle

The sleeping brain cycles between rapid eye movement (REM) and Non-REM sleep through 5 stages of varying depth.

The normal cycle occurs every 90 minutes.

In 8 hours of sleep one normally attains five to six REM stages. One must have REM sleep in order to feel rested and function well during waking hours.

If your sleep cycle is frequently interrupted at night by a dog barking or child crying or some other noise, you will not feel rested in the morning even if you've slept 7 to 9 hours.

Age and Sleep

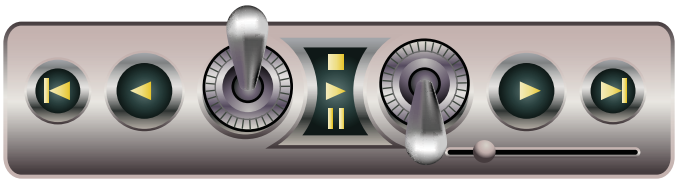
Sleep efficiency deteriorates with age.

In general, older individuals spend less time in deep non-REM sleep. Consequently, nighttime awakenings and daytime sleepiness result.

Sleep required by the average aircrew member

- The average person sleeps 7 to 9 hours per day.
- However, sleep length can be reduced 1 to 2 hours without any serious performance decrement over an extended period.
- Once the period ends, the individual must return to their normal sleep length to prevent negative effects on mental and physical functioning.
- As a rule, 5 hours of sleep per night is the absolute minimum for continuous operations (in other words, operations lasting 14 days or more).
- However, some individuals may tolerate as little as 4 hours per night for short periods (up to 1 week), but there is no way to determine which soldiers require the least amount of sleep other than through actual experience.

When determining sleep requirements for an individual or crew endurance plan consider:



1. The complexity of the job to be performed:

   The more complex the task to be performed, the more sleep required for the individual to execute the task.

   For example, flying duties involve a great deal of attention, concentration, and rapid decision-making and therefore require much more rest to perform than manual labor tasks, like digging fighting positions, that are not challenging intellectually.

2. The potential for loss from errors due to fatigue:

   Aviators require strict crew rest plans since flying is a dangerous endeavor with high potential for loss of life and high-tech equipment.

3. The individual's ability to function with little sleep:

   This ability varies from person to person.

   In AR 95-1 Flying Regulations, the Army has published guidelines for the maximum amount of time aviators can perform flying duties in a given day.

   The amount of time recommended varies with the type of flight operations, since some types of flight, like CBRNE MOPP training, are more fatiguing than others.

- Take actions to adjust to shift work and prevent circadian desynchronization.
  - This can be accomplished by maintaining a consistent sleep/wake schedule even on days off.
  - It is also important, when on the night shift, to avoid exposure to daylight from dawn to 10:00 am.
  - Wear sunglasses if you cannot go to sleep before the sun rises (as long as this does not pose a safety hazard), and while asleep consider wearing a sleep mask to avoid any exposure to light.
  - Exposure to light before you go to sleep will interfere with the quality of your sleep. Find or create a dark place to sleep.
  - You may eat a light snack before going to sleep, but do not go to sleep too full or too hungry.

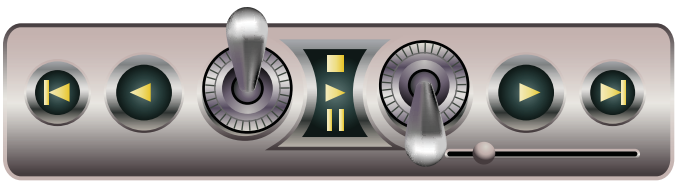
CAUTION:

A person with difficulty sleeping during their normal sleeping period should NOT nap at other times of the day, as this will perpetuate the insomnia.

Prevention of Fatigue

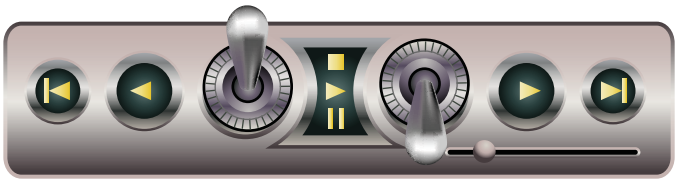
Total prevention of fatigue is impossible, but its effects can be significantly moderated. The following recommendations should be considered in any individual or crew endurance plan:

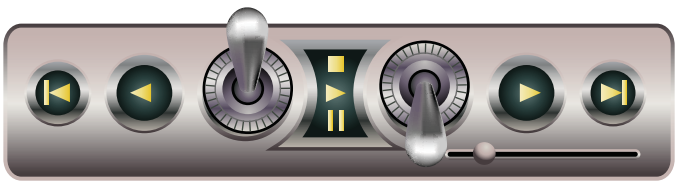
- The sleep environment should be cool, dark, and quiet.
  - This ensures a quiet restful sleeping environment
  - It is also best to avoid working or reading in bed, as this may actually contribute to problems in falling asleep.
  - The bed should be associated only with sleeping and sexual activity.
  - If you desire to read before going to bed, do this in a chair outside the bedroom and then go to bed.
- Avoid caffeine consumption for about 6 hours prior to going to sleep.
  - Maintaining good physical fitness with regular, strenuous exercise will also help resist the effects of fatigue.
  - Napping
- A good strategy for coping with sleep deprivation during continuous operations or other times when it is difficult to get a good night's sleep.
- In general, longer naps are more effective than short ones, but even 10-minute naps can be beneficial.
- It is better to nap when your body temperature is low, early in the morning, or in the afternoon around 1300, as this will facilitate falling asleep and the general quality of sleep.



Treatment of Fatigue

- **Sleep!** The most essential action to take for treating fatigue once its occurred is to get plenty of natural sleep
- **Avoid Alcohol.** Although alcohol is the most widely used sleep aid in the U.S., its use as such is not appropriate, since it is disruptive to the quality of sleep. Specifically, alcohol will put you to sleep quickly, but later in the night you will not sleep as soundly and will spend less time in REM sleep, which will cause you to feel fatigued during the waking hours.
- **Don't sleep too long.** After 24 - 48 hours of sleep deprivation DO NOT sleep overly long during the recovery period. This could interfere with your normal sleep/wake cycle and cause sleeping problems the next night.
- **Keep up your routine sleep habits.** When trying to sleep outside your normal bedtime, prepare for sleep as you normally would have - wear the clothes to bed that you would normally wear, darken the room, and keep noise to a minimum. If you can't fall asleep within 30 minutes of going to bed, get up, read a boring book, like your "dash 10," in a room other than your bedroom, preferably with soft lights, and then try again to go to bed again when you begin to feel drowsy. You may need to repeat this strategy a couple times in a night until you are fatigued enough to fall soundly asleep.
- **Other techniques.** It is also important when treating fatigue to maintain a reasonable work schedule during waking hours. It makes no sense to try to catch up on sleep and then exhaust yourself during the day. Also ensure that you eat properly to give your body the fuel it needs to recuperate. If you find that you are having consistent sleep problems for more than two weeks, consult your flight surgeon. Also, if fatigue threatens to impair your flying, ground yourself until you are rested enough to fly again. This is certainly a more reasonable course of action than crashing an aircraft due to fatigue!





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